U.S. Department of Energy

Office of Science

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Office of Science

Advancing Energy, Economic and National Security Through Science, Technology and Environmental Stewardship

Briefing for FESAC

FY06 Budget Request for the Office of Science

Raymond L. Orbach
Director, Office of Science
April 7, 2005

US Competitiveness

"Given the rising bar for competitiveness, the United States needs to be in the lead or among the leaders in every major field of research to sustain its innovation capabilities."

U.S. Competitiveness 2001: Strengths, Vulnerabilities and Long Term Priorities, **Council on Competitiveness**

Office of Science

- **The Office of Science is the primary source of support for the Physical Sciences.**
  - Provides 42% of federal support to the physical sciences
  - Provides primary support to select sub-fields (e.g. high energy physics, nuclear physics, nuclear medicine, heavy element chemistry, plasma physics and magnetic fusion, and catalysis.)
  - Manages long-term, high-risk, high-payoff multidisciplinary science programs to support DOE missions
  - Directly supports (FY '05) the research of around 23,500 Ph.D.s, Post Docs and Graduate Students

- **Constructs and operates large scientific facilities for the future of science.**
  - Accelerators, light and neutron sources, nanotechnology research centers
    - Used by more than 19,000 researchers every year
    - Number of users expected to increase dramatically with Spallation Neutron Source (SNS) and nanocenter user facilities commencing operations
  - Linac Coherent Light Source begins construction
    - Ten billion times brighter, in the hard x-ray range, than any other light source in the world
    - new field of ultra-fast science

Office of Science Missions

Secure Energy Future

- ITER: Abundant and clean energy for the future.
- Materials: Fabrication and performance for efficient energy production, storage and use: Spallation Neutron Source commences operations
- Nanoscience: Four Nanoscale Science Research Centers (NSRCs) will begin operations: Center for Nanophase Materials Sciences (Oak Ridge National Lab); Molecular Foundry (Lawrence Berkeley National Lab); Center for Integration Nanotechnologies (Sandia National Lab and Los Alamos National Lab); and Center for Nanoscale Materials (Argonne National Lab).
- Climate Change: Understanding the effects of energy production and use. Environmental measurements to test, and improve climate change prediction models. Determine the global carbon cycle. Perform basic research for biological sequestration of carbon in the biosphere.
- Research: Nanostructured materials; catalysis, membranes and gas separation; photovoltaic electrolysis and artificial photosynthesis; Genomics: GTL microbial production of hydrogen; funding the first round hydrogen research solicitation; solar energy—chromophors for increased solar cell efficiency; fusion energy and plasma science.

Environment

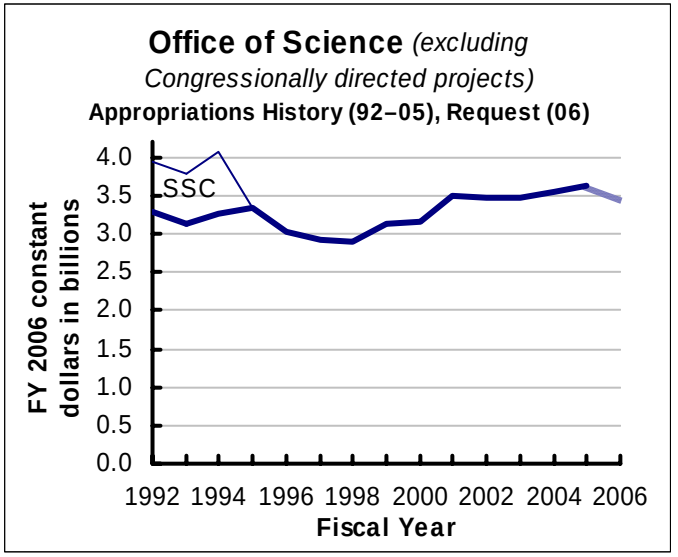
- Genomics: GTL -- Harnessing biotechnology to protect the environment; ecology baselines.
- Natural and accelerated bioremediation research
- Basic research for environmental management
- Carbon sequestration

Future of Science

- Key Questions: Understanding the beginning of time, exploring the nature of energy and matter from quarks to the cosmos.
- Scientific Computation:
    - Next Generation Computing Architecture to improve performance for science and industry
    - Leadership Class Computing for science and economic competitiveness
- Scientific Workforce Development: Using the unique capabilities of the DOE laboratories for teacher professional development; enhancing the diversity of the scientific workforce
- Physical science enhancement of biomedical applications

FY 2006 funding 1.6% below FY 2005 appropriations (excluding Congressionally directed projects), 0.9% above the FY 2005 request

- A difficult budget year – however, the Office of Science continues to provide world leadership in science, and for energy security.
- The budget forces us to make tough choices. SC's prioritization provides for a strong and healthy future for U.S. science consistent with the 20-year facilities outlook.



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Office of Science
FY 2006 Congressional Budget Request

(dollars in thousands)

	FY 2004 Comparable Approp.	FY 2005 President's Request	FY 2005 Comparable Approp.	FY 2006 President's Request	FY 2006 Request vs. FY 2005 Request		FY 2006 Request vs. FY 2005 Appropriation	
Science								
Basic Energy Sciences	991,262	1,063,530	1,104,632	1,146,017	+82,487	+7.8%	+41,385	+3.7%
Advanced Scientific Computing Research	196,795	204,340	232,468	207,055	+2,715	+1.3%	-25,413	-10.9%
Biological & Environmental Research	624,048	501,590	581,912	455,688	-45,902	-9.2%	-126,224	-21.7%
(Congressionally-directed projects)	*(136,798)*	*(——)*	*(79,608)*	*(——)*	*(——)*	*(——)*	*(-79,608)*	*(-100.0%)*
(Core Biological and Environmental Research)	*(487,250)*	*(501,590)*	*(502,304)*	*(455,688)*	*(-45,902)*	*(-9.2%)*	*(-46,616)*	*(-9.3%)*
High Energy Physics	716,170	737,380	736,444	713,933	-23,447	-3.2%	-22,511	-3.1%
Nuclear Physics	379,792	401,040	404,778	370,741	-30,299	-7.6%	-34,037	-8.4%
Fusion Energy Sciences	255,859	264,110	273,903	290,550	+26,440	+10.0%	+16,647	+6.1%
Science Laboratories Infrastructure	55,266	29,090	41,998	40,105	+11,015	+37.9%	-1,893	-4.5%
Science Program Direction	150,277	154,943	153,706	162,725	+7,782	+5.0%	+9,019	+5.9%
Workforce Development for Teachers and Scientists	6,432	7,660	7,599	7,192	-468	-6.1%	-407	-5.4%
Small Business Innovation Research/Technology Transfer	114,915	——	——	——	——	——	——	——
Safeguards and Security	56,730	67,710	67,168	68,712	+1,002	+1.5%	+1,544	+2.3%
Subtotal, Science	3,547,546	3,431,393	3,604,608	3,462,718	+31,325	+0.9%	-141,890	-3.9%
Use of prior year balances	-11,173	——	-5,062	——	——	——	+5,062	+100.0%
Total, Science	**3,536,373**	**3,431,393**	**3,599,546**	**3,462,718**	**+31,325**	**+0.9%**	**-136,828**	**-3.8%**
(Total, excluding Congressionally-directed projects)	*(3,399,575)*	*(3,431,393)*	*(3,519,938)*	*(3,462,718)*	*(+31,325)*	*(+0.9%)*	*(-57,220)*	*(-1.6%)*

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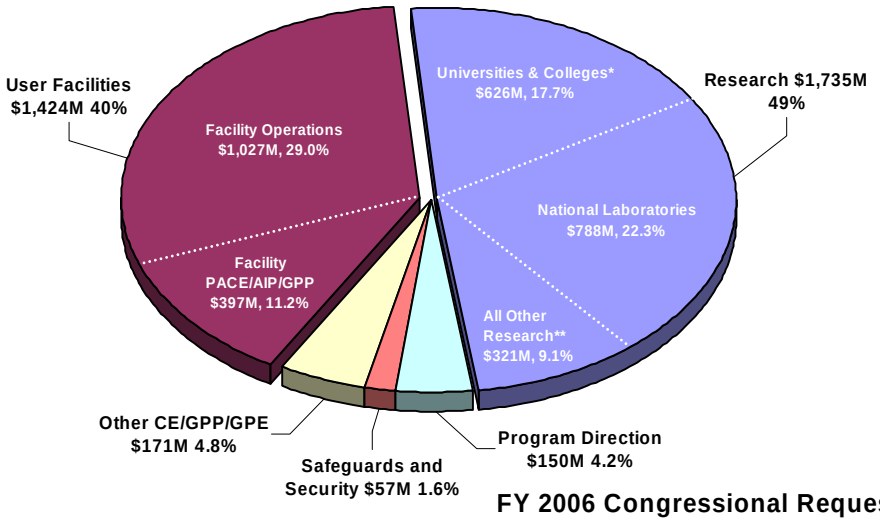
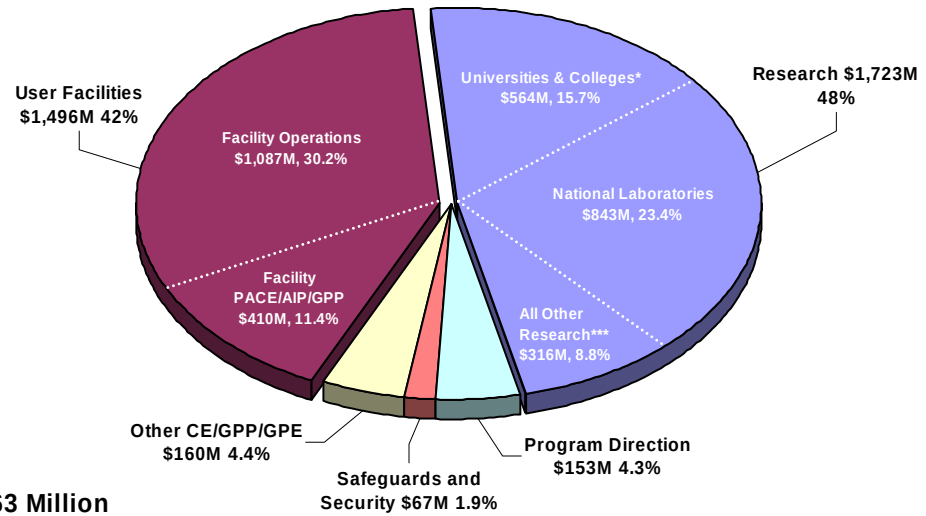
Investments to maintain U.S. scientific leadership and ensure that leading-edge research facilities will be available for the future.

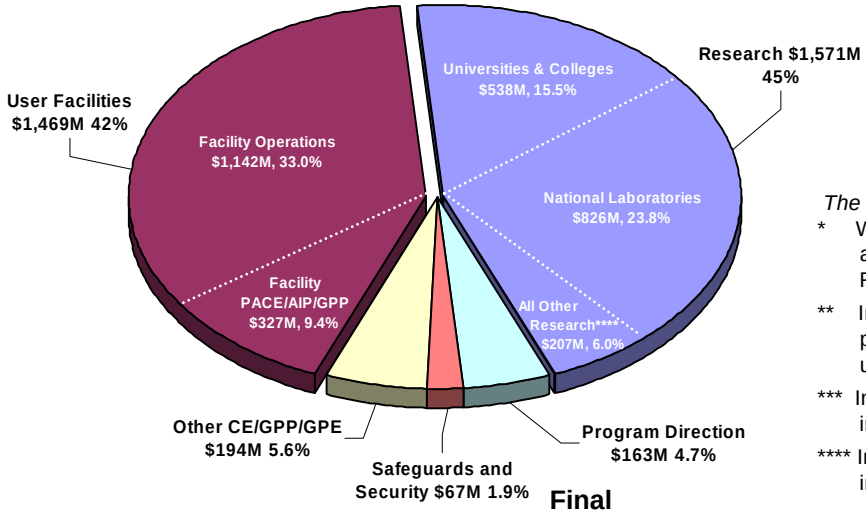
FY 2004 Appropriation, $3,536 Million



FY 2005 Appropriation, $3,600 Million



FY 2006 Congressional Request, $3,463 Million



The area of each pie chart is proportional to the funding total for the year.

* When pending FY 2005 Congressionally-directed university grants are awarded (currently in "all other" in FY 2005), FY 2004 and FY 2005 university funding will be approximately equal.

** Includes funding for SBIR/STTR, non-profits, other federal agencies, private institutions, and Congressionally-directed projects other than university grants.

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The President's FY 2006 budget propels the United States into leadership in the following areas:

- **Fusion --** ITER (fabrication begins) – will demonstrate the scientific and technological feasibility of creating and controlling a sustained burning plasma to generate energy**.**
- **Leadership Class Computing –** 40 combined TeraFlops (TF) system performance at the end of CY 2005 (20 TF "Red Storm" and 20 TF X1-E) – the most powerful computer for open science in the world.
- **Spallation Neutron Source –** SNS — world leading neutron source (by an order of magnitude) begins operation at ORNL
- **Nanotechnology –** four of five Nanoscale Science Research Centers begin operations in FY 06.
- **X-Ray Free Electron Laser --** start construction of Linac Coherent Light Source at SLAC – ushers in the field of ultra-fast science
- **High Energy Physics –** initial operations of the Neutrinos at the Main Injector (NuMI) project at Fermilab -- fundamental physics of neutrino masses and mixings. Large Hadron Collider at CERN (pre-operations, operation and maintenance of detectors, and computing and software infrastructure)
- **Nuclear Physics –** continue to use the unique capabilities of the Continuous Electron Beam Accelerator Facility (CEBAF) at Jefferson Laboratory and the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory for studies of the internal quark-gluon structure of nucleons and the properties of hot, dense nuclear matter.
- **Climate Change –** research to address the role of clouds. Invest in scientific infrastructure to develop, test, and run the climate change prediction models used in the international assessments of climate change. Continue study of the global carbon cycle and basic research for biological sequestration of carbon in the biosphere.
- **Genomics --** GTL will accelerate research underpinning the Department's ability to develop microbe-based biotechnology solutions for clean energy, carbon sequestration, and environmental remediation.